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Seed production of Italian ryegrass: dates and methods of seeding

by

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Introduction

Italian ryegrass (*Lolium multiflorum* Lam.) is a biennial grass species but in Atlantic Canada it is commonly grown as an annual in short term rotations for pasture or for soil amendment. Large quantities of ryegrass seed are sold in eastern Canada which are imported to the region. Some seed of Italian ryegrass has been produced in PEI when overwintering conditions have been favorable.

Overwintering is necessary since inflorescence development of Italian ryegrass requires dual induction including cool temperatures (3-10• C) and short days (12-16 weeks) in the fall. Seed development of Italian ryegrass takes place during the long days of the following growing season. Overwintering conditions exert severe stress on Italian ryegrass plants which are known to have low to medium cold tolerance. Management strategies that enhance survival of overwintering plants are important in developing seed production of Italian ryegrass in PEI. Cost saving and environmentally sound methods of establishment are also important. The aims of this research were to assess the effects of seeding dates and methods of establishment on persistence and seed production of two cultivars of Italian ryegrass.

Materials and methods

The field experiments were conducted at the Crops and Livestock Research Centre in Charlottetown, Prince Edward Island. The soil was a fine sandy loam with a pH of 6.0 to 6.2. Fertilizer P and K were applied according to soil test results to maintain medium to high fertility levels of soil.

The plot size was 2 * 5 m. Italian ryegrass cv. Lemtal was sown at 9.6 kg/ha and Ajax at 14.8 kg/ha for a constant 400 viable seeds/ m^2. Barley cv. Chapais was sown at 115 kg/ha (250 seeds/m^2) with ryegrass and at 160 kg/ha (350 seeds/m^{21} when sown alone. Row space was 20 cm.

The times and methods of seeding were:

Mid-May seeding

1 Italian ryegrass (IR) seeded alone in cultivated seedbed

2 IR + barley sown in cultivated soil, barley harvested for grain

Mid-August seeding [after barley grown & harvested for silage]

3 IR seeded alone in cultivated seedbed after rototilling to a depth of 15 cm.

4 IR direct drilled into barley stubble with a Hunter pasture renovator.

Early September seeding [after barley grown & harvested for grain]

5 IR seeded alone in cultivated seedbed after rototilling to a depth of 15 cm.

6 IR direct drilled into barley stubble with a Hunter pasture renovator.

Times and rates of fertilizer application were:

Seeding year		
17-17-17	400 kg/ha	mid-May
15-5-15	300	mid-August
Production years		
17-17-17	500	early May
15-5-15	300	mid-August

Before harvest plants were cut at ground level in two 50 cm segments of outside row on each plot for determining number of fertile tillers. Spikelets per tiller were determined in 10 random tillers.

Italian ryegrass was clipped when seed moisture content was 39 to 43 %. The harvested material was placed in jute bags and air dried in 1998 and 1999. In 2000 forced air drying was used to reduce drying time. About two months after harvest the dried ryegrass was treshed and cleaned. Germination and thousand seed weights were determined according to procedure of the International Seed Trade Association. Experimental design was a split-plot with seeding dates in main plots and cultivars in sub-plots, and replicated four times.

Results

Three year means are presented in Tables 1 and 2. In general, wintersurvival was variable within experiments each year but it was possible to harvest seed crop in three consecutive years. Italian ryegrass recovered quickly in the spring and produced adequate stands for seed harvest. It is noted that overwintering conditions were quite favorable during the experimental period. The key findings in this study were:

-Seed yields (Table 1) were 14 to 20 % higher for seeding in mid-August than in early May or September. The conventional and no-till methods resulted in similar seed yields of both Lemtal and Ajax ryegrass cultivars.

yields were not influenced by seeding date or method of seeding.

-Lemtal produced more tillers than Ajax but there was no difference in spikelet numbers per tiller.

-Germination was not influenced by the treatments.

-Regrowth herbage yields were greater for Ajax (2800 kg/ha) than Lemtal (2465 kg/ha) but the herbage

-In herbage regrowth Lemtal was slightly higher in crude protein and also lower in ADF than Ajax but treatments had no effect on NDF concentrations.

-Mineral composition of herbage in regrowth appears in Table 2. In general, treatments had little or no effect on mineral composition.

Conclusion

It is concluded that both Lemtal and Ajax ryegrasses overwintered adequately. Protected fields with good drainage should enhance wintersurvival of Italian ryegrass. Seed yields of about 1000 kg/ha suggest that seed production can be financially viable but risk of winterkill needs to be taken into consideration. Regrowth herbage yields were high and provide quality feed for late season grazing or biomass for maintaining soil resource.

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Table 1. Seed and herbage regrowth yields, reproductive tiller density, spikelet number, germination and 1000-seed weight of Italian ryegrass, and concentrations of crude protein, neutral detergent fibre and acid detergent fibre in regrowth, three year means.

	Seed [z] kg ha^{-1}	Tillers m^{-2}	Spikelets tiller^{-1}	Germination %	TSW g	Regrowth kg ha^{-1}	Crude protein g kg^{-1}	NDF g kg^{-1}	ADF g kg^{-1}
Date of seeding									
May	1004	915	16.7	87.0	2.9	2757	21.3	564.1	302.8
August	1206	929	17.4	88.7	3.2	2662	20.5	575.6	317.6
September	1050	1015	16.9	83.6	2.8	2478	21.9	566.3	305.4
sem (n=48, 22 df)	47.1	42.1	0.19	1.8	0.12	91.7	0.43	7.9	4.3
Method of seeding									
Cultivated	1072	924	17.2	87.0	3.0	2623	21.1	564.3	307.2
Residue till	1101	983	16.8	85.9	3.0	2641	21.4	573.1	310.0
sem (n=72, 99 df)	31.8	30.0	0.13	1.4	0.07	60.5	0.25	4.4	1.9
Cultivar									
Lemtal	1071	1038	16.9	88.3	2.3	2465	21.9	571.7	305.4
Ajax	1102	868	17.1	84.6	3.7	2800	20.6	565.7	311.7
sem (n=72, 99 df)	31.8	30.0	0.13	1.4	0.07	60.5	0.25	4.4	1.9

[z] At 14 % moisture content

Table 2. Mineral composition of herbage regrowth of Italian ryegrass, three year means

	Ca %	Mg %	Na %	P %	K %	S %	Cu ppm	Zn ppm	Mn ppm	Fe ppm	B ppm
Date of seeding											
May	0.46	0.19	0.073	0.32	2.40	0.21	5.89	21.7	156	64.5	3.72
August	0.48	0.18	0.081	0.31	2.30	0.19	5.65	21.2	160	61.3	3.75
September	0.47	0.19	0.089	0.32	2.50	0.21	5.95	21.2	153	63.3	3.85
sem (n=48, 22 df)	0.01	0.002	0.004	0.004	0.048	0.005	0.128	0.396	4.14	2.79	0.065
Method of seeding											
Cultivated	0.47	0.19	0.080	0.31	2.41	0.20	5.92	21.8	155	62.6	3.79
Residue till	0.48	0.19	0.082	0.32	2.39	0.20	5.74	21.0	157	63.4	3.76
sem (n=72, 99 df)	0.01	0.002	0.002	0.003	0.032	0.003	0.065	0.277	2.32	1.72	0.051
Cultivar											
Lemtal	0.49	0.19	0.077	0.32	2.29	0.21	6.00	22.3	161	64.5	3.81
Ajax	0.46	0.19	0.085	0.31	2.51	0.20	5.67	20.5	151	61.6	3.74
sem (n=72, 99 df)	0.01	0.002	0.002	0.003	0.032	0.003	0.065	0.277	2.32	1.72	0.051